Amendments to the Specification

In the title of the invention, please change the title of the invention to:

Harmonic Cantilevers and Imaging Methods for Atomic Force Microscopy

Please amend paragraph [0021] as follows:

Figure 4 plots the magnitudes of the tip sample interaction forces and the corresponding Fourier spectrum of forces for 4% (~~Figure 4(a)~~Figures 4(a) and (d)), 8% (~~Figure 4(b)~~Figures 4(b) and (e)), and 12% (~~Figure 4(c)~~Figures 4(c) and (f)) contact times.

Please amend paragraph [0027] as follows:

Figure 10, which includes Figures 10(a) to 10(i), illustrates the process steps for forming the harmonic cantilever of Figure 9 according to one embodiment of the present invention.

Please amend paragraph [0043] as follows:

The periodic nature of tip-sample forces results in higher order Fourier components (harmonics) which have frequencies exactly at the integer multiples of the vibration frequency of the cantilever. The magnitudes of these harmonics mainly depend on the contact time and peak force. For illustrative purposes, the sample is modeled as a linear spring and the attractive forces were neglected. Then, the interaction forces become a clipped sine wave. Figure 4 plots the magnitudes of the tip sample interaction forces and the corresponding Fourier spectrum of forces for 4% (~~Figure 4(a)~~Figures 4(a) and (d)), 8% (~~Figure 4(b)~~Figures 4(b) and (e)), and 12% (~~Figure 4(c)~~Figures 4(c) and (f)) contact times. The three different contact times, 4%, 8% and 12% correspond to hard medium and soft samples. In order to compare the three different cases, it is assumed that the average force (0th order Fourier component) is same in all of them. Then, the magnitudes of the harmonics are normalized to the 0th order Fourier component. The plots in Figure 4 show that the higher order components, especially the ones around 15th harmonic, depend highly on the contact time. Therefore, one can argue that in TM-AFM the information about the sample elasticity is in the higher harmonics of the tip sample interaction forces.

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Please amend paragraph [0058] as follows:

Figure 10, which includes Figures 10(a) to 10(i), illustrates the process steps for forming harmonic cantilever 20 of Figure 9 according to one embodiment of the present invention. In the present embodiment, the fabrication process of harmonic cantilever 20 is a three-mask process.

Please amend paragraph [0059] as follows:

Referring to Figure 10, the cantilever is formed on an SOI wafer including a base silicon layer 100, an oxide layer 102 and a device layer 104 (~~insert~~ Fig. 10(b)). The device layer can be a silicon layer or a silicon nitride layer. Then, a tip mask is applied to the SOI wafer to define an area where the probe tip of the cantilever is to be formed (~~inserts~~ Figs. 10(a) and (b)). The tip mask pattern is applied to an oxide/nitride hard mask 106 formed on device layer 104. The wafer structure is subjected to a plasma etch (~~insert~~ Fig. 10(c)) to form the probe tip. The probe tip is subsequently oxide sharpened (~~insert~~ Fig. 10(d)).

Please amend paragraph [0060] as follows:

A second mask is applied to define the cantilever geometry (~~insert~~ Fig. 10(e)). In the present embodiment, the second mask defines opening 22 to be formed in the body of the cantilever arm. The cantilever pattern is transferred to an oxide/nitride mask 108 by plasma etch and buffered oxide etch. Then, the cantilever is formed by plasma etching device layer 104 (~~insert~~ Fig. 10(f)). The front and back side of the wafer is then covered with nitride layers 109 and 110, respectively (~~insert~~ Fig. 10(g)). The wafer back side is patterned using a third mask and a KOH etch (~~insert~~ Fig. 10(h)). After etching through the wafer, the cantilever is released by removing the protective top-side nitride layer 109 using plasma etching and removing the oxide in a buffered oxide etch (~~insert~~ Fig. 10 (i)).

Please amend paragraph [0065] as follows:

Figure 12, including Figures 12(a) and 12(b), is the spectrum of the vibrations of the harmonic cantilever around the 15-17th harmonics of the driving frequency in tapping-mode atomic force microscopy. In ~~the plot of insert~~ Figure 12(a), the 16th harmonic is exactly equal to the third resonance frequency of the cantilever, recorded at 300 Hz bandwidth. In ~~the plot of insert~~ Figure 12(b), the 16th harmonic is slightly less than the third resonance frequency (596 KHz instead of 598 KHz), recorded at 1 KHz bandwidth.

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Please amend paragraph [0066] as follows:

In Figure 12, the spectrum around the 15th to 17th harmonics is given when third resonance frequency is exactly equal to 16 times the driving frequency (~~insert~~ Fig. 12(a)) and when there is a slight mismatch (~~insert~~ Fig. 12(b)). By comparison of the signal strength at 16th harmonics of the signal in ~~insert~~ Fig. 12(a) and the signal in ~~insert~~ Fig. 12(b), it can be observed when the harmonic cantilever has a higher order resonance frequency that matches the integer multiple of the driving frequency, the harmonic cantilever can improve the higher-harmonic signal by 15-20dB.

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